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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,218	11/28/2000	Eric Demers	723-960	7828

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EXAMINER	
HARRISON, CHANTE E	

ART UNIT	PAPER NUMBER
2672	

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/726,218	DEMERS ET AL.	
	Examiner	Art Unit	
	Chante Harrison	2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 April 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) *14, 24-34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12,13,15,16,18-21 and 23* is/are rejected.

7)☒ Claim(s) *11,17 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4 & 6*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 14 and 24-34 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 10.

Claim Rejections - 35 USC § 102

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Bradford Ritter, U.S. PG Pub 2002/0030681 A1, 3/2002.

As per independent claim 1, Ritter discloses providing a vertex attribute descriptor that describes Tangent and Binormal vector data for each of plural vertices of a polygon (pp. 5, Para 57): computing a light direction vector (pp. 3, Para 32), computing texture coordinate displacements for each of said vertices in response to said light direction vector and said Tangent and Binormal vector data (i.e. interpolating the texture coordinates, s and t, for each pixel) (pp. 4, Para 40-43): generating texture coordinate

values in response to said computed texture coordinate displacements (i.e. processing texture gradients to determine texture values) (pp. 5, Para 56), and texture mapping said polygon based on said texture coordinate values to provide an embossing effect (pp. 5, Para 55): wherein the texture coordinate-- displacements computing step does not use Normal vector data to compute said texture coordinate displacements (i.e. using the light vectors, tangent and binormal vectors to determine texture coordinate displacement/changed gradient vectors) (pp.5-6, Para 62-63).

As per dependent claim 2, Ritter discloses per-vertex data includes at least a Normal, a Tangent, and a Binormal vector (i.e. each vertex is described by its normal, tangent and binormal) (pp. 5, Para 57).

As per dependent claim 3, Ritter discloses transforming the Tangent and binormal vectors to eye-space (i.e. tangent and binormal vectors are transformed from object space to eye space) (col. 6, Para 65).

As per dependent claim 4, discloses performing vector dot-product computations between the computed light direction vector and the Tangent and Binormal vectors (pp. 5, Para 62).

As per dependent claim 5, Ritter discloses the light direction vector computing step comprises computing at least a normalized light-to-vertex vector (pp. 7, Para 114).

As per independent claim 15, Ritter discloses a vector processing unit comprising at least two distinct dot-product computation circuits for computing vector dot-product (i.e. two separately performed dot product calculations) (pp. 3, Para 32): and a bump-mapping unit for computing at least a normalized light-to -vertex vector (pp. 3, Para 32; pp. 7, Para 114) and a set of texture displacement values for use in creating an embossed texture effect (pp. 4, Para 40-43).

3. Claims 6-9, 12 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Mark Peercy et al., U.S. Patent 6,163,319, 12/2000.

As per independent claim 6, Peercy discloses decoding a generalized texture coordinate generation function that specifies generating embossed-stvle bump-mapping texture displacements (i.e. using software instructions to decode/identify for a vertex the texture data to be manipulated) (col. 24,ll. 25-28, 57-58): perturbing input texture coordinates based on binormals and light direction information in response to the decoding step (i.e. perturbations are a function of a matrix of the binormal, tangent and normal vectors multiplied by the lighting vectors) (col. 8, ll. 5-10; col. 10, ll. 20-35; Fig. 1 "Mp"; col. 15, ll. 58-67), using the input texture coordinates and the perturbed texture coordinates to look up texels in a height-field bump map (i.e. a precomputed height field is used to provide data based on the vertex data for which the transformation is being performed and the perturbed normal) (col. 21, ll. 30-55): computing bump height information based on the texel values (col. 10,ll. 48-53), and combining the bump height information with pixel Color value information to provide embossed-style bump mapping (col. 8, ll. 25-31; col. 9, ll.8-11; col. 15, ll. 40-57), wherein the combining step is performed in texture processing hardware (col. 8,ll 20-31; col.14, ll. 20-25, 50-60).

As per dependent claim 7, Peercy discloses the perturbing step is performed in hardware (i.e. perturbing can be done on the fly in hardware as the pipeline can process commands immediately) (col. 8,ll.20-31; col. 14, ll. 20-25, 50-60).

As per dependent claim 8, Peercy discloses computing a texture coordinate displacement values based a Tangent vector and a Binormal vector and a dot-product of each vector with a light direction vector (i.e. a matrix of the binormal, tangent and normal vectors is multiplied by the lighting vectors) (col. 8, ll. 5-10; col. 10, ll. 20-35; Fig. 1 "Mp"; col. 15, ll. 58-67).

As per dependent claim 9, Peercy discloses subtracting texel data acquired using perturbed texture coordinates from texel data acquired using input texture coordinates (col. 18, ll. 12-26).

As per independent claim 12, Peercy discloses in a graphics system including a processor and a separate graphics processing pipeline having transformation and lighting circuitry, the pipeline performing emboss-style bump-mapping based on texels in response to texture coordinate displacements computed from Tangents and Binormals, an improvement comprising: texture coordinate displacement computation circuitry included within the graphics pipeline vertex transformation and lighting circuitry (col. 10, ll. 48-52; Figs. 2B & 3).

As per independent claim 13, Peercy discloses in a graphics system including a processor and a separate graphics processing pipeline, the pipeline performing emboss-style bump-mapping based on texels in response to textures coordinate displacements computed from Tangents and Binormals, an improvement comprising

performing the texture coordinate displacement computation within the pipeline (Fig. 2B & 3; col. 10, ll. 48-52; col. 14; ll. 55-60).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peercy et al., U.S. Patent 6,163,319, 12/2000.

As per dependent claim 10, Peercy fails to specifically disclose decoding a generalized vertex attribute description function that specifies a Tangent vector and a Binormal vector. Peercy teaches storing and fetching a perturbed normal (col. 6, ll. 50-60). However it would have been obvious to one of skill in the art to incorporate specifies a Tangent vector and a Binormal vector with the disclosure of Peercy because processing the texture involves performing computations involving transformation of shading vectors by computations with a matrix having tangent and binormal values.

6. Claims 16, 17-21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peercy et al., U.S. Patent 6,163,319, 12/2000 and further in view of John Montrym et al., U.S. Patent 6,452,595 B1, 9/2002.

As per independent claim 16, Peercy discloses a system as similarly claimed in independent claim 20, which follows. Therefore the rationale applied in the following rejection of independent claim 20 applies herein.

As per dependent claim 17, Peercy fails to specifically disclose the bump-mapping, unit further comprises a FIFO input buffer for storing incoming, texture coordinate values, which Montrym discloses (i.e. using a FIFO to pass data from the lighting logic unit, LLU, until it is needed by the memory logic unit, MLU) (col. 23,ll.53-60). Peercy teaches using any of various types of memory to fetch texture data (col.19, ll. 54-67). It would have been obvious to one of skill in the art to incorporate Montrym's FIFO buffer for storing texture values with the disclosure of Peercy to improve the speed in which texture data can be retrieved from memory.

As per dependent claim 18, Peercy discloses the bump-mapping unit further comprises a floating point adder for computing a light-to-vertex vector (col. 4, ll. 17-22) in view of Montrym.

As per dependent claim 19, Peercy discloses the dot-product computation units comprise at least one floating point multiplier (col. 1,ll. 37-41; col.15,ll. 64-65): and one floating point adder(col. 1, ll. 37-41; col. 16, ll. 10-16) in view of Montrym.

As per independent claim 20, Peercy discloses a first vector dot-product computation unit for transforming vector data to eye-space (col. 21,ll. 5-17) a second vector dot-product computation unit for computing lighting direction vector dot-products (col. 16, ll.22-30): at least one floating point multiplier unit (i.e. the use of floating processing and a multiplier suggests a floating point multiplier) (col. 1,ll. 37-41; col.15, ll. 64-65): and at least one floating point adder unit (i.e. the use of floating processing and an adder suggests a floating point adder) (col. 1, ll. 37-41; col. 16, ll. 10-16): wherein in response to an API bump mapping function instruction the vertex transformation and lighting processing hardware transforms vector data per-vertex into eye-space (col. 14, ll. 20-29; col. 8, ll. 60-64), computes texture coordinate displacement values based on lighting direction vector dot-products (col.15, ll. 55-67) and adds the displacement values to texture coordinates for use in producing emboss-style bump-mapped texture effects (col. 8,ll. 45-55).

Peercy fails to disclose an inverse square-root computation unit for computing a reciprocal of a square-root of an input value, which Montrym discloses (col. 15, ll. 9-12, 35-39).

Peercy teaches using floating point processing and using an inverse of the modelview matrix, comprising the tangent, binormal and normal vectors, to transform the lighting vectors (col. 1,ll. 37-41; col. 21, ll. 5-10).

Montrym teaches a transform module performing an inverse square root operation to generate a floating-point reciprocal square root for use in processing displacement (i.e. bump) mapping.

It would have been obvious to incorporate Montrym's inverse square root operation to generate a floating-point reciprocal square root with the disclosure of Peercy for the benefit of determining the surface parameterization on the texture map.

As per dependent claim 21, Peercy fails to specifically disclose discloses a graphics API vertex attribute function that specifies at least Normal, Tangent and Binormal vectors per vertex, or specifies an index to at least each of these vectors stored in memory. Peercy teaches storing and fetching a perturbed normal (col. 6, ll. 50-60) in view of Montrym. However it would have been obvious to one of skill in the art to incorporate specifying a Tangent vector and a Binormal vector with the disclosure of Peercy because processing the texture involves performing computations involving transformation of shading vectors by computations with a matrix having tangent and binormal values.

As per dependent claim 23, Peercy fails to specifically disclose the Normal, Tangent and Binormal vectors each comprise three 32-bit vector elements. Montrym discloses a vertex attribute buffer storing 32 bit floating data (col. 6, ll. 8-11; col. 7,ll. 63-65). Peercy teaches using floating-point operations (col. 1,ll. 35-45). It would have been obvious to

one of skill in the art to incorporate Montrym's disclosure of 32- bit data with the disclosure of Peercy to improve the transformation and lighting of image data.

7. Claims 11, 17 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art fails to specifically disclose specifying Tangent and Binormal vectors by reference to separate memory indexes and specifying one of at least eight different textures for producing embossing effects.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chante Harrison whose telephone number is 703-305-3937. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on 703-305-4713. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chante Harrison
Examiner
Art Unit 2672

March 19, 2004

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